BNL-94414-2010-AB

# *TRANSFORMATION OF PHYSICAL, CHEMICAL AND OPTICAL PROPERTIES OF BLACK CARBON AEROSOL PARTICLES*

Cross, E. S., Onasch, T. B., Ahern, A., Wrobel, W., Slowik, J. G., Olfert, J. S., Lack, D. A., Massoli, P., Cappa, C. D., Schwarz, J. P., Spackman, J. R., Fahey, D. W., Sedlacek, A. J., Trimborn, A., Jayne, J., Freedman, A., Williams, L. R., Ng, N. L., Mazzoleni, C., Dubey, M. K., Brem, B. T., Kok, G. L., Subramanian, R., Freitag, S., Clarke, A. D., Thornhill, D. A., Marr, L. C., Kolb, C. E., Worsnop, D. R., and Davidovits, P.

*Submitted to the American Geophysical Union Fall Meeting,*
*San Francisco, CA, Dec. 13-17, 2010*

November 2010

**Atmospheric Sciences Division/Environmental Sciences Dept.**

**Brookhaven National Laboratory**

**U.S. Department of Energy**
**Office of Science**

*Managed by*
Brookhaven Science Associates, LLC
for the United States Department of Energy under
Contract No. DE-AC02-98CH10886

ABSTRACT
Accurate measurements of the chemical, physical, and optical properties of aerosol particles containing black carbon are necessary to improve current estimates of the radiative forcing caused by black carbon in the atmosphere. Toward this goal, a three-week intercomparison study of 18 instruments designed to measure black carbon was conducted. Each instrument sampled soot particles as a function of the particle mobility size (in the range 30 to 300 nm), particle number concentration, particle shape (dynamic shape factor and mass-mobility exponent), particle chemistry and density (changed via coatings) and black carbon mass. In selected runs, particles were coated with a measured thickness (few nm to ~150 nm) of sulfuric acid or dioctyl sebacate (DOS). Highlights of the study to be presented include: (1) Mass specific absorption enhancement as a function of coating type and thickness, (2) wavelength dependence of absorption, scattering, and extinction as a function of particle coating, (3) particle shape determination as a function of fuel-to-air ratio including observations of structural rearrangement of fractal soot particles due to different coatings. Implications of the laboratory results to the radiative effects of black carbon in the atmosphere will be discussed.